siliconcoach
video analysis solutions

INTRODUCTION TO VIDEO ANALYSIS

USING SILICONCOACH PRO

clinical education retail sport

This training manual is intended to accompany a siliconcoach training session and is designed as a reference tool to help deliver the interactive parts of the course.

For more in-depth assistance please refer to the Help menu in siliconcoach (press F1 in Pro) or download the comprehensive siliconcoach Pro User Manual available from the siliconcoach Pro support website (http://www.siliconcoach.com/SupportCentres/#support_centers)

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WHAT IS VIDEO ANALYSIS?

Video analysis is the process of filming human movement, importing the footage to a computer and then analysing performance using custom-designed computer software programs.

There are two categories of video analysis software: skill analysis and match analysis.

Skill analysis software

- Used to review one skill at a time in close detail.
- Used primarily for technique assessment and assists in skill acquisition.
- Helps to identify areas of improvement in technique.
- Assists in diagnosing potential causes of injury.

Match analysis software

- Used to record event statistics during a match.
- Footage can be used to understand tactical decision making during a game.
- Video can be tagged to record specific events.
- Software can then filter and playback specific events by keyword or tagged codes.

Siliconcoach Pro falls under the **skill analysis software** category. You can read more about this below.

Skill vs Match Analysis: What's the Difference?
Advances in computer and video technology have initiated new tools for those interested in studying movement. The two major areas of software evolution for Movement Analysis are Notational Analysis and Technique Analysis.

Notational Analysis, also called Match Analysis or Time in Motion Analysis, is usually performed in a sporting situation where the analysts and coach maybe interested in how much work each player did, how far they ran, how many contacts they made, errors, penalties, etc. Coders watch the whole game and at the same time they 'tag' predetermined events into the software. After this is done the analysts can then combine this 'tagged' information into statistical tables that can uncover movement patterns. It is primarily used to expose strategies, tactics and weaknesses in both the coaches own players and in the opposition. Notational Analysis software is specifically designed for this role and is quite different to that used in Technique Analysis.

Technique Analysis software, also called Skill Analysis software, is more concerned with discrete skills (e.g. kicking, passing, hitting, running, jumping) rather than a series of movements over time as is the focus of Notational Analysis. A coach or analyst may have used Notation Analysis or their experienced eye to identified that one of their player's is weak in a certain skill. They would then use Technique Analysis software to work with the player to improve this deficit with the ultimate goal of making their match performance more complete. Technique Analysis software has two key

components. The first one is to provide the tools used to analyse the skill and the second is to provide the tools to enhance feedback to the athlete in order to accelerate an improvement in technique.

Although Technique Analysis software was originally designed for the athlete it has now evolved into a valuable tool in education and clinical analysis. Teachers at secondary and tertiary level can focus on the analysis features of the software to teach the principles of movement to their students. Students can also us the analysis features to undertake analyses for themselves. Both the analysis and feedback features are extremely valuable for the clinician involved with human movement. They can analyse the movement to determine the problem(s), then use the feedback features to educate and retrain the patient.

Both Technique Analysis software and Notational Analysis software are important tools for movement analysis but vastly different in their design. One cannot do the others job so it is important you identify what your needs are before you purchase. Siliconcoach makes a comprehensive suite of Technique Analysis software but does not make Notational Analysis software.

EQUIPMENT CONSIDERATIONS

The following diagram illustrates a typical video analysis system:

- Camera
- Laptop or PC
- Video cable
- Tripod (highly recommended)

Cameras

- All major brand Mini DV camcorders are compatible.
- A 3CCD camera is optional and gives same resolution but better colour.
- A stills camera that captures video or web cams do not provide high quality video for video analysis.
- DVD cameras and most Hard Disk cameras to not have a live output so you will need an AV to USB converter to work with TimeWarp.
- Refer to http://www.siliconcoach.com/SupportCentres/#support_centers and choose **Hardware** from the Pro Support Centre.

Shutter speed

- The shutter controls the period of time that the videotape is exposed to the image/light.
- If the image is moving at high speeds, then a low shutter speed (1/120) will result in a blurred image.
- A high shutter speed (1/500 to 1/1000) will result in a clear picture.
- The shutter speed on a video camera can be manually controlled depending on the activity being filmed.
- On many cameras you do not have total manual control of the shutter speed but these cameras can be set to a SPORTS mode, an icon of a runner or a golfer (in the case of Sony cameras) will appear in the LCD screen when sports mode is ON.
- Refer to http://www.siliconcoach.com/SupportCentres/#support_centers and choose **Getting Good Video** from the Pro Support Centre.

Additional Lighting

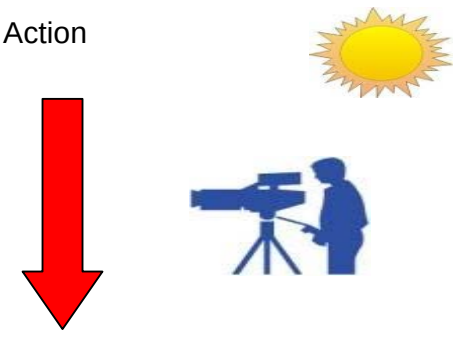
- As the shutter speed increases, less light is able to reach the videotape, causing the image to become darker or blurred or both.
- Ensure you have good lighting if you intend to video at high shutter speeds.
- If filming indoors with a high speed shutter additional lighting (spot lights) will generally be required.
- Refer to http://www.siliconcoach.com/SupportCentres/#support_centers and choose **Getting Good Video** from the Pro Support Centre.

Focus Controls

Most cameras have an auto focus capability.

- In many sporting set-ups it is recommended that you use the MANUAL FOCUS mode because it prevents the camera focusing on an unwanted object in the background or foreground as the subject moves.
- As a rule of thumb, use the manual focus whenever possible.
- Refer to http://www.siliconcoach.com/SupportCentres/#support_centers and choose **Getting Good Video** from the Pro Support Centre.

Set-up considerations for filming

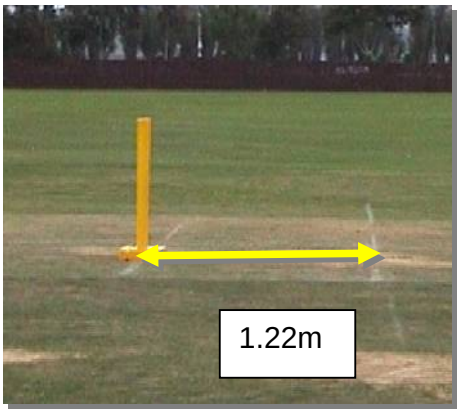


- The plane of movement will need to be perpendicular to the camera if you intend to make measurements on screen later.
- Is the camera positioned on a tripod to reduce vibrations?
- Is the sun or light going to cast shadows on the event being captured? Lighting should come from behind the camera and direct light towards the event but not in the eyes of the subject.

- Will the whole event be captured without panning the camera? Panning introduces perspective error.
- Is the subject wearing clothing that will obscure their actions or limb end point positions? Where possible encourage fitted clothing to be worn.
- Refer to http://www.siliconcoach.com/SupportCentres/#support_centers and choose **Getting Good Video** from the Pro Support Centre.

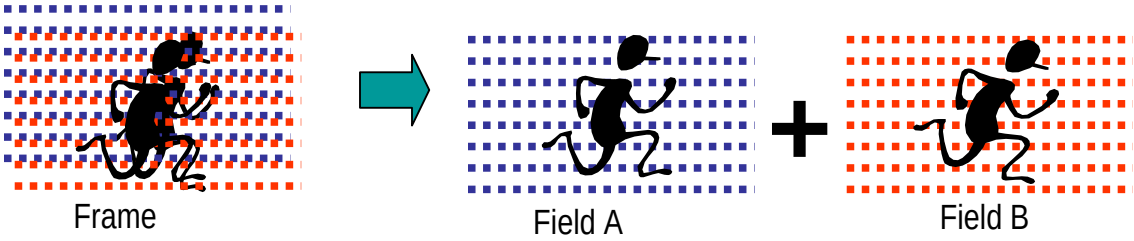
Setting a scale for measurements

- If you intend to take measurements as part of your video analysis, you will need to set a scale in the plane your subject is moving in.
- Measure a known distance in your filming frame and write this down for later reference.
- A useful scale could be field/ court markings or equipment already available.
- You can also put two markers on the ground and measure the distance between them.
- This scale will be used later to convert pixels on the computer to a distance on the screen.



Frames and Fields

- Generally a video camera takes 25 pictures (frames) per second (30 in the USA).
- Each frame is made up of two sub-pictures (fields) separated by $^{1}/_{50}$ of a second ($1/60^{th}$ in the USA) in time that creates a blur.
- The siliconcoach software splits the frame to give 50 different fields per second.



- Some video footage will only give 25 images per second that cannot be split (progressive scan, DVD and Hard Disk cameras).
- To view this type of footage in Pro, double-click on your Screen Setup and change the Frame/Field setting (see page 13)

CHECKLIST:

At this stage of the training course you should have an understanding of:

- The differences between skill analysis and match analysis software.
- What equipment is required to conduct a video analysis session.
- How to set-up the equipment for a filming session.
- What camera settings are best suited to filming sports movement.
- How to set a scale for taking measurements.
- The difference between fields and frames.

NOTES:

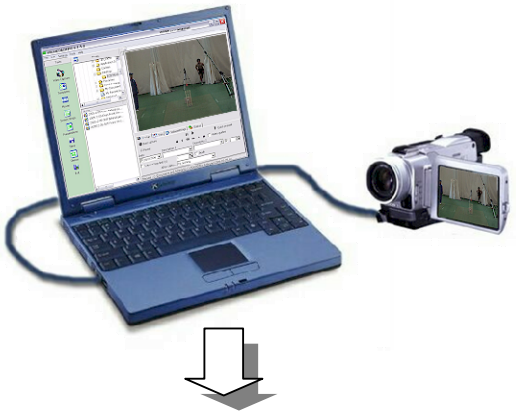
Conceptual Overview: the four stages to mastering siliconcoach Pro

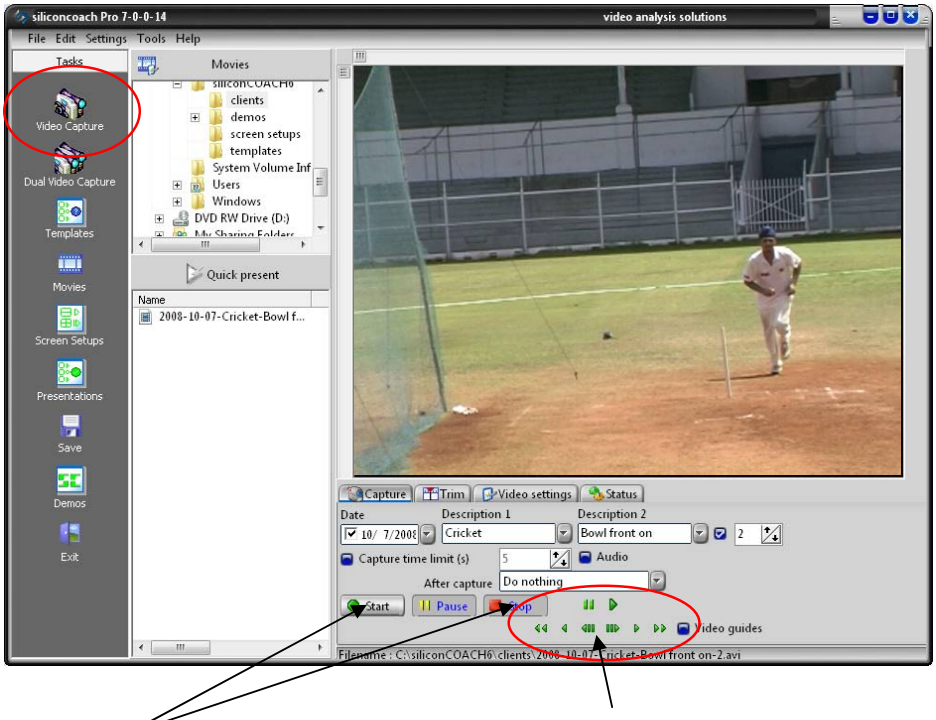
Whether you are a beginner or an advanced user of siliconcoach Pro, the process of using the software follows the same four steps shown below:

The remainder of this manual will take you through the four-step process introducing beginner level and then more advanced level skills in the order of stages above.

STEP 1: CAPTURE AND EDIT VIDEO

- Connect your MiniDV camera to the laptop using your Firewire cable. If you are using Pro 7 you can connect 2 cameras but you will need 2 Firewire cards, not just two ports on the one card.
- Turn on your camera and switch to 'camera' mode to capture live footage, or 'play' mode to capture previously recorded footage.
- Press the '**Video Capture'** icon in the Tasks menu bar.





Press these buttons to START and STOP video capture

Press these buttons to control the camera in Tape mode. (Depending on your camera, you may have to press PLAY the first time to start the camera playing.)

Where are the movies saved

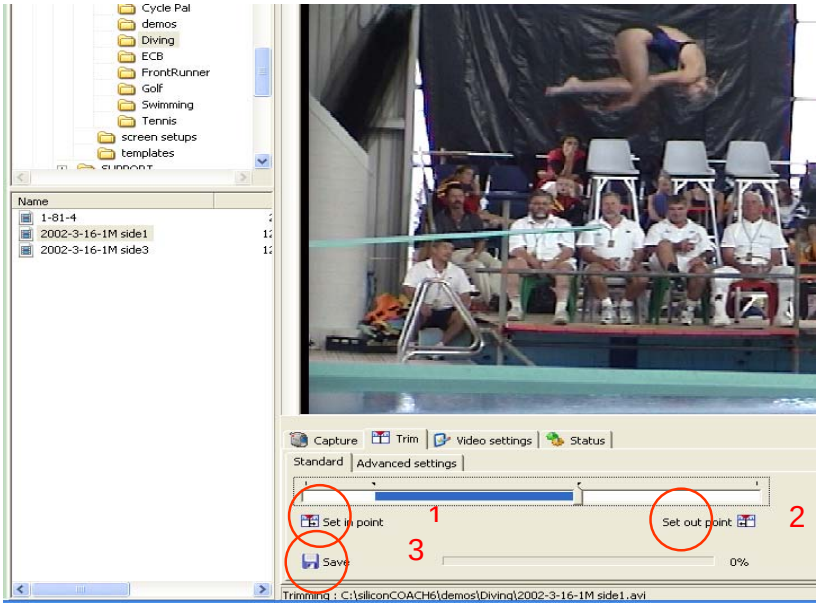
- The default folder for saved movies is C:\siliconCOACH6\Clients
- Movie files can be moved to other folders after capture using Windows Explorer.
- To search for movie files always remember to press the '**Movies'** icon' first in the task bar.

Trim Movies

Trim movie immediately after capture:

Select 'Trim' in the 'After capture' drop down list to take you to the trim function immediately after you have captured a video clip.

1. Move the slider to the desired start frame and press **'Set in point'**
2. Move the slider to the desired end frame and press **'Set out point'**
3. Press **'Save'**. A cut/trimmed version of your movie will be saved.



Trim a previously captured movie:

- Select the 'Trim' tab in the Video Capture section to access the trim function menu.
- Navigate to the movie file you want to trim in the explorer window.
- Double-click on the movie you want to trim. The movie will appear in the preview box.
- Repeat the steps above to set in and out points and save a cut version of your movie clip.

CHECKLIST:

At this stage of the training course you should have an understanding of:

- The four steps of working through siliconcoach Pro.
- How to connect your camera to your laptop and detect the camera in Pro.
- How to conduct a live capture direct from the camera.
- How to capture a movie file from a mini-DV tape.
- How to trim a movie you have immediately captured.
- How to trim a movie you have previously captured and stored in your Movies library.

NOTES:

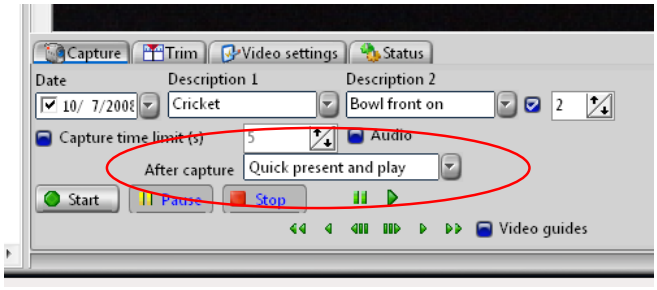
STEP 2: BUILDING A PRESENTATION

Siliconcoach Pro is similar to PowerPoint in that you build a slide presentation and then populate the slides with content (in this case we use movies as our content).

Quick Present and Play

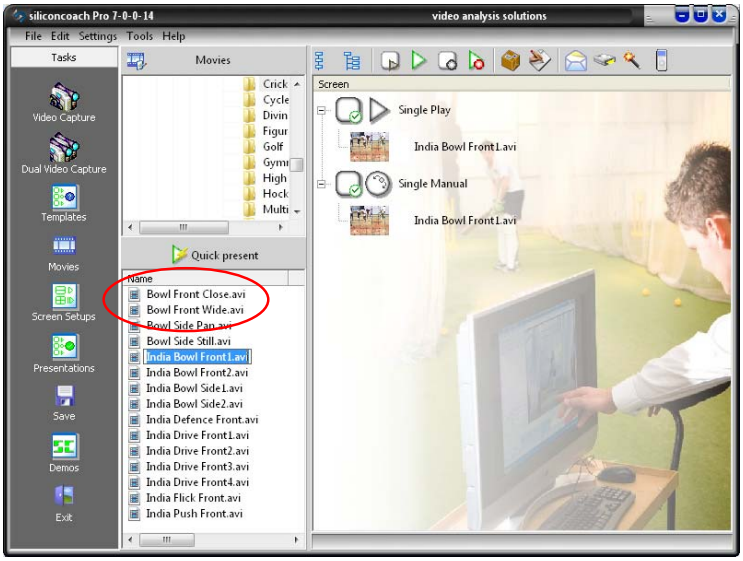
Quick Present after capture

- To automatically build a simple slide presentation immediately after video capture, select the 'Quick Present and Play' option in the 'After capture' menu.
- When you press '**Stop Capture'** you will automatically be presented with a replay of the movie clip you captured, and then presented with an analysis screen.



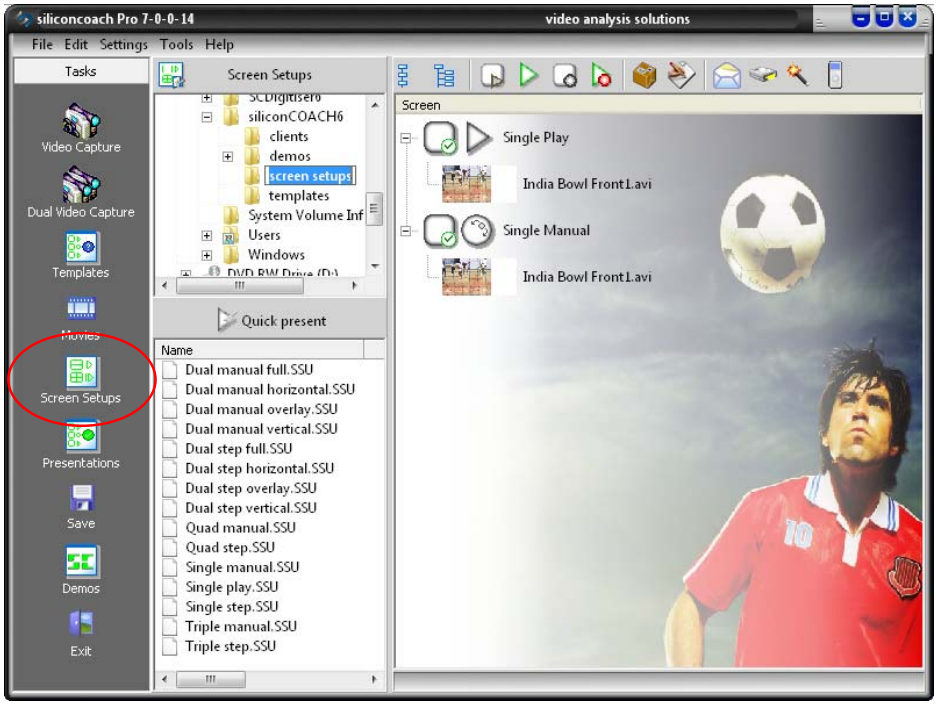
Quick Present a movie in your library folder

- To automatically build a slide presentation to play a previously saved movie file, highlight the file name in your movie folder then press the '**Quick Present'** button in the top menu.



Screen setups - the building blocks of your presentation

- A presentation is made up of a series of Screen Setups (or slides) named according to their layout and features.
- Access the list of different slides by pressing the '**Screen Setups'** icon on the Tasks menu bar.

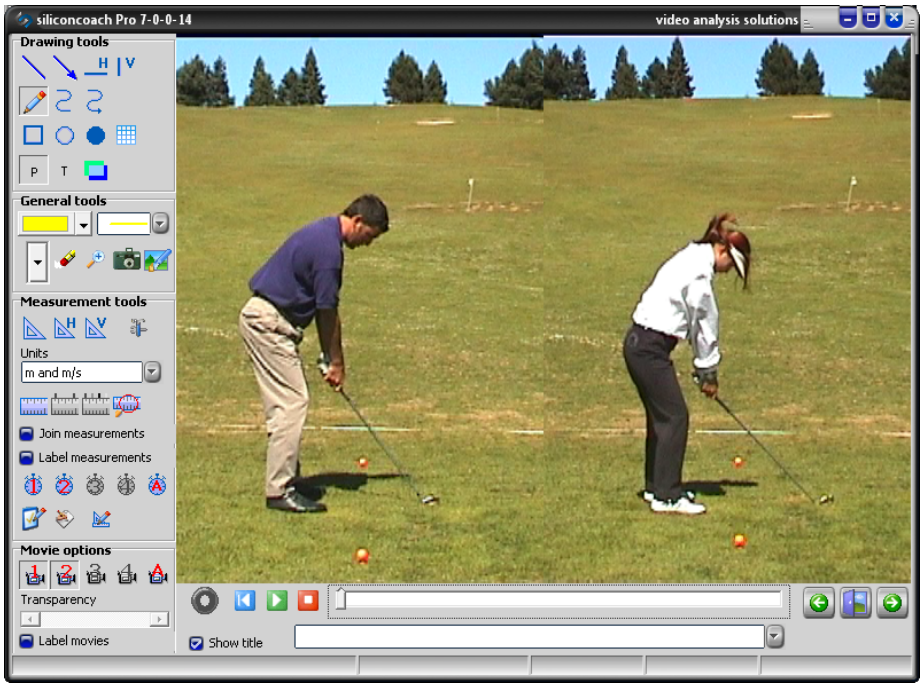


What do all the slide names mean?

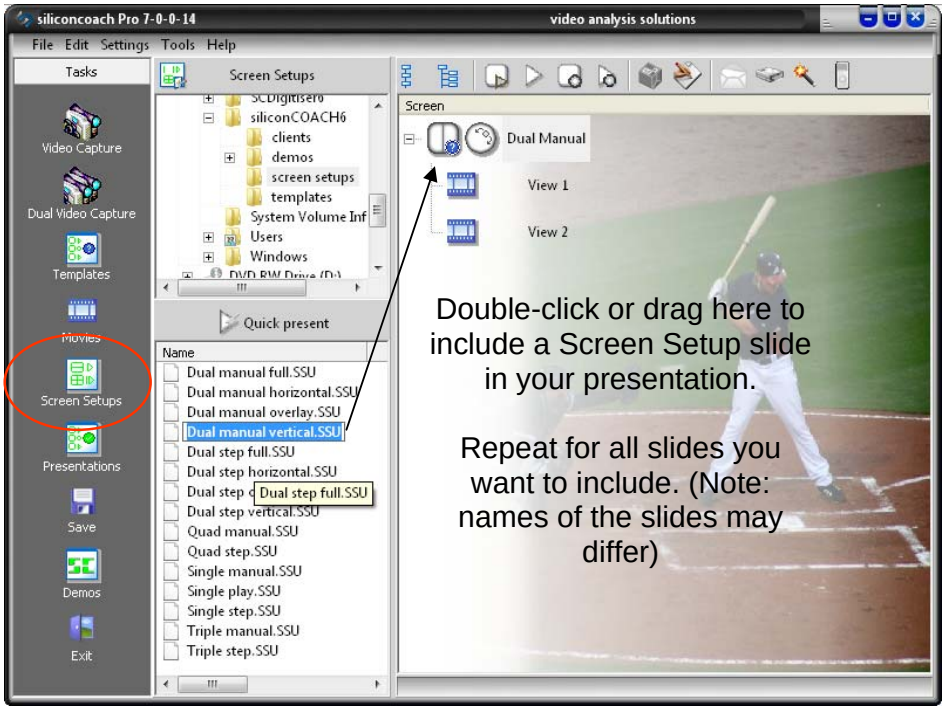
The screen setup slides are named according to how they play back your movie files.

Name	Definition
Single, dual, triple or quad	Describes the number of movies (1,2,3 or 4) played on the slide at the same time.
Play	Plays movie at full speed.
Step	Plays movie in slow motion speed.
Manual	Allows manual control of playback with analysis tools.
Horizontal	Movies are separated on the slide by a horizontal line. The movies are cropped to fit the split screen mode.
Vertical	Movies are separated on the slide by a vertical line. The movies are cropped to fit the split screen mode.
Overlay	Movies are overlaid one on top of the other.
Full	Movies are played without cropping.

For example: A *Dual Manual Vertical* screen setup slide is shown below:

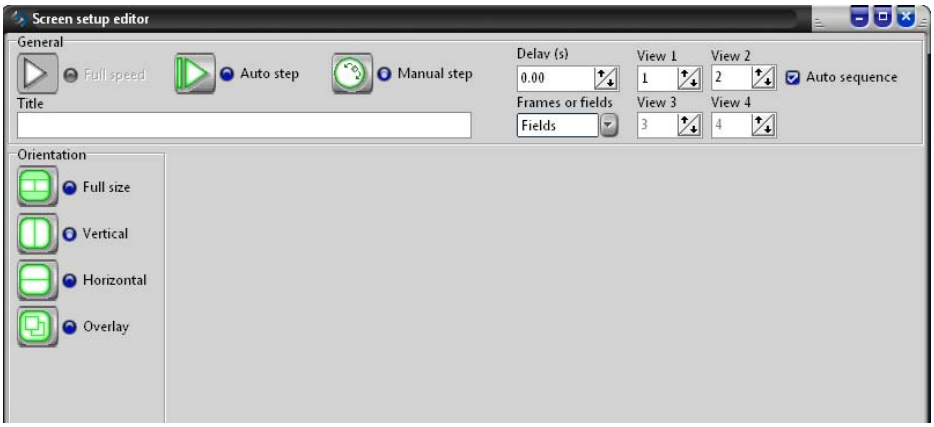


Adding Screen Setup Slides to your presentation



Changing the slide properties

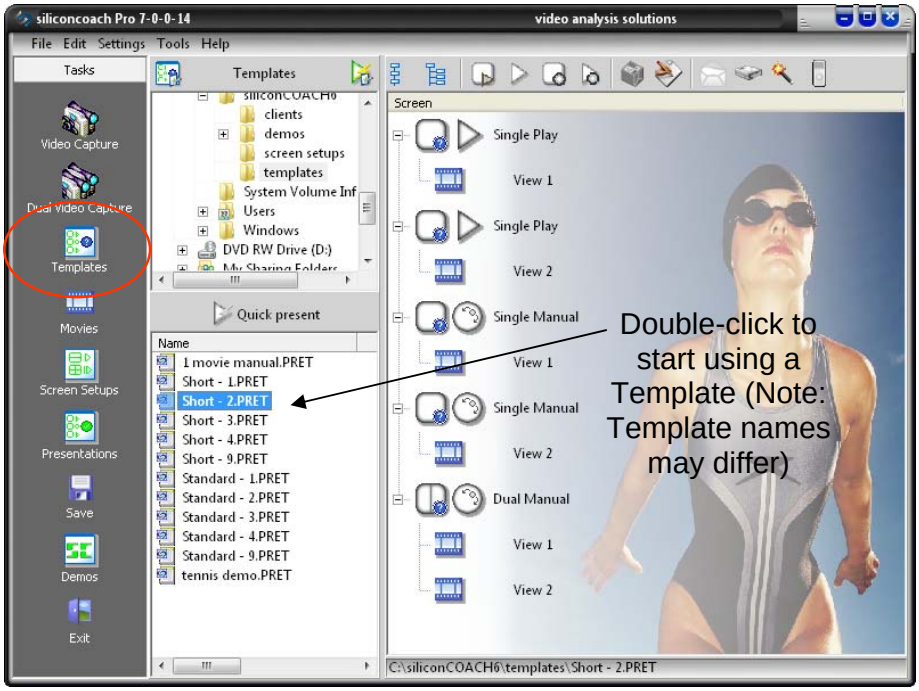
- To change the properties of your slide, double-click the green slide icon to open the Screen Setup Editor box.
- You can change the type of slide, playback speed, movie views, and whether the movies play in frame or field mode.



Readymade templates

To save you time building your own presentation, siliconcoach Pro provides a number of ready-made templates for you to choose from.

Access the templates by pressing the **'Templates'** icon from the Tasks menu bar.

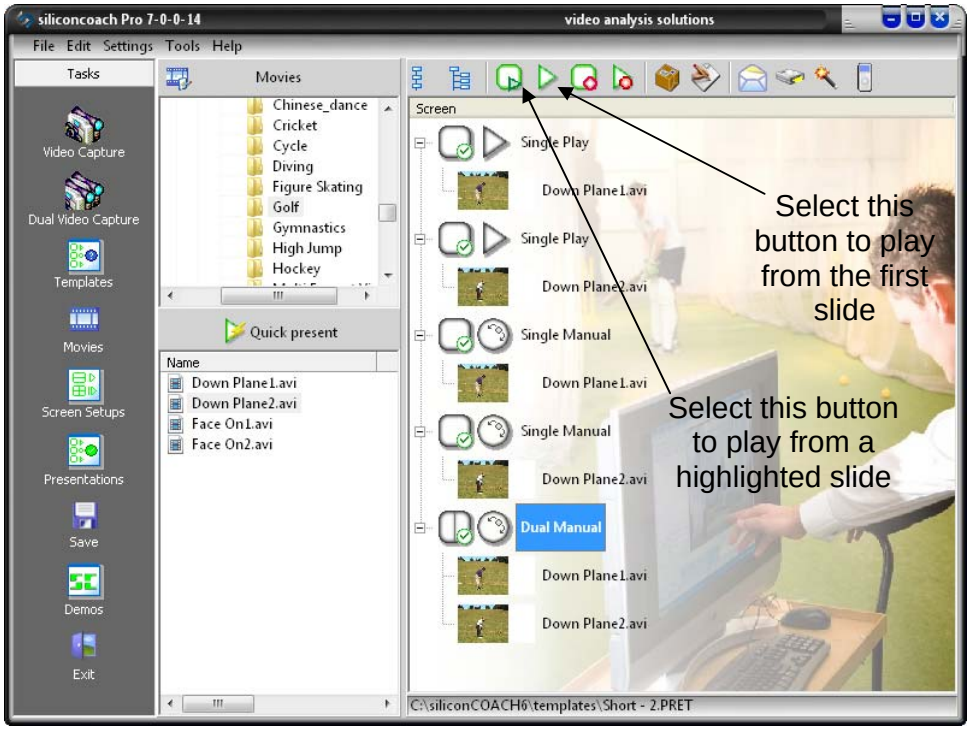


Build and save your own Templates

- Build your own template out of screen setup slides, then go to File>Save As and select 'Template' to save it to the Templates library.
- You may want to change the 'View' number in certain slides. For example, if you have built 4 single manual slides in a row, they will all be 'View 1' (showing the same movie).
- To change the slides so that the 2nd, 3rd, and 4th slides show different movies double-click on each slide icon to open the Screen Setups Editor box.
- Change the 'View' number in the upper right of the window.

Play a presentation

A presentation can be played from the first slide or from a selected slide further down in the presentation.



CHECKLIST:

At this stage of the training course you should have an understanding of:

- How to create a simple presentation using Quick Present and Play.
- How to build a presentation using screen setups.
- What the screen setup slide names mean and the differences in their properties.
- How to use the ready-made templates and how to create your own templates.
- How to edit the screen setup slide properties using the Screen Setup Editor.
- How to play a presentation from the first slide, and then from a slide later in the sequence.

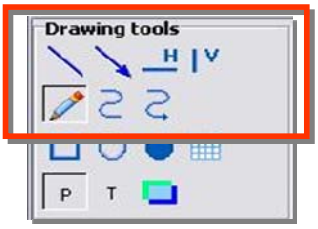
NOTES:

Step 3: Analyse a presentation

Siliconcoach Pro comes with a number of tools to help analyse movement. These tools can be accessed in all MANUAL mode screen setup slides.

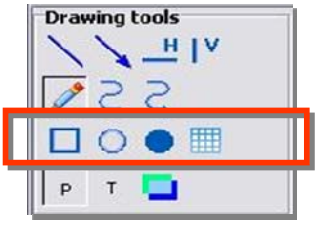
Draw lines

- lines,
- arrows
- horizontal lines
- vertical lines



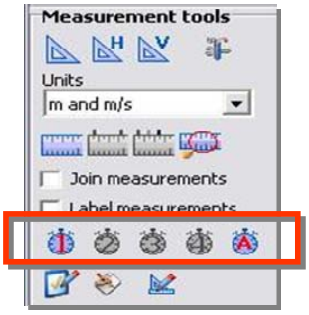
Draw shapes

- squares
- circles
- dots
- grids



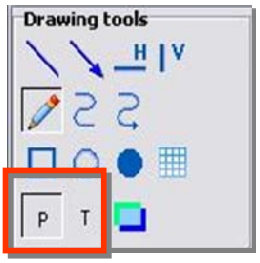
Measure time

- Up to four stopwatches are available (each movie in your slide has a stopwatch that appears in top left hand corner of the screen).



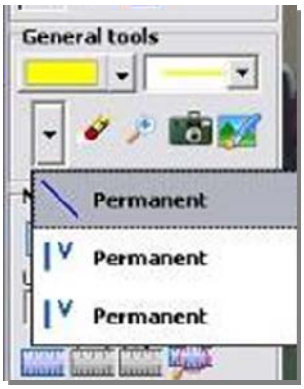
Temporary and Permanent drawings

- Permanent drawings (P) stay on all frames until analysis window is closed.
- Temporary drawings (T) stay on the frame they were drawn on and then disappear when the movie is advanced to the next frame.



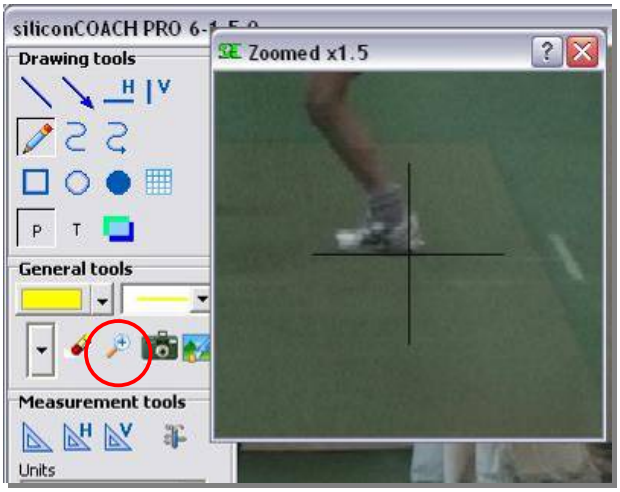
Erase drawings

- Select the drop-down box to scroll through to the drawing you want to erase.
- Press the **'pencil eraser'** icon to erase all drawings.



Magnifying glass

- Press the **'magnifying glass'** icon to open zoom window.
- Choose level of magnification and resize magnification window to desired size.



Measure angles

- Free angle: Requires 3 clicks to make an angle e.g. knee joint angle.
- **H**: Requires 2 clicks to make an angle relative to an imaginary horizontal line e.g. forearm angle.
- **V**: Requires 2 clicks to make an angle relative to an imaginary vertical line e.g. back angle.

CHECKLIST:

At this stage of the training course you should have an understanding of:

- How to access the analysis tools.
- What the different analysis tools are and how to use them.

NOTES:

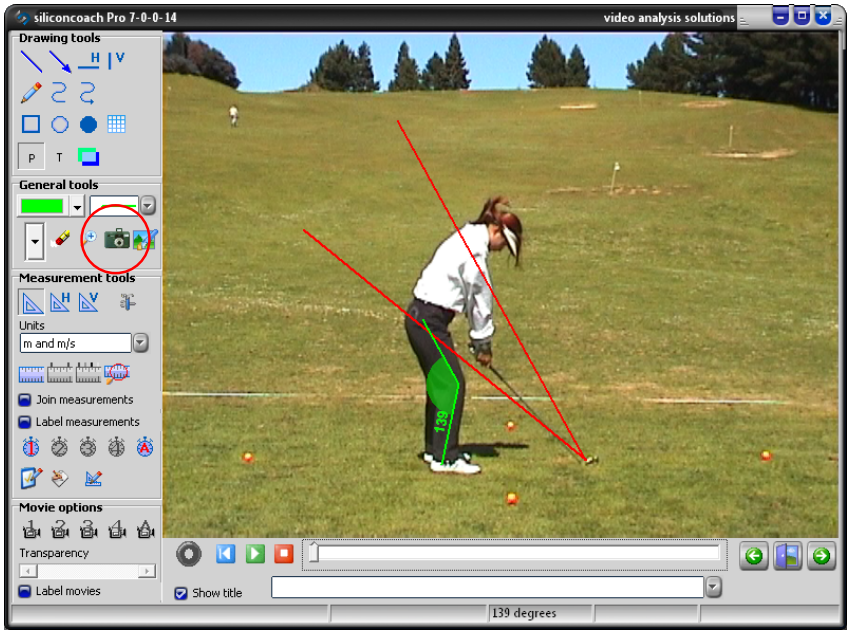
STEP 4: EXPORT A PRESENTATION

Once you have completed an analysis on a key frame of your video, you can take a screenshot of the screen and save it as a still image for use in reports, presentations, or email.

Create a still-image screenshot

Press the **'camera'** icon to save the screen and drawings.

- Give the image file a name (e.g. ***.jpg)
- Save it to a known destination on your computer (e.g. My Documents).
- This jpg file is now available to insert into WORD, POWERPOINT or to send as an attachment in your email program.

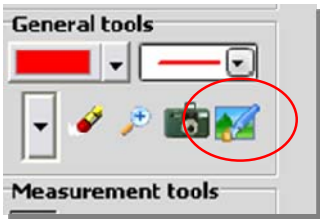


Save as .jpg file

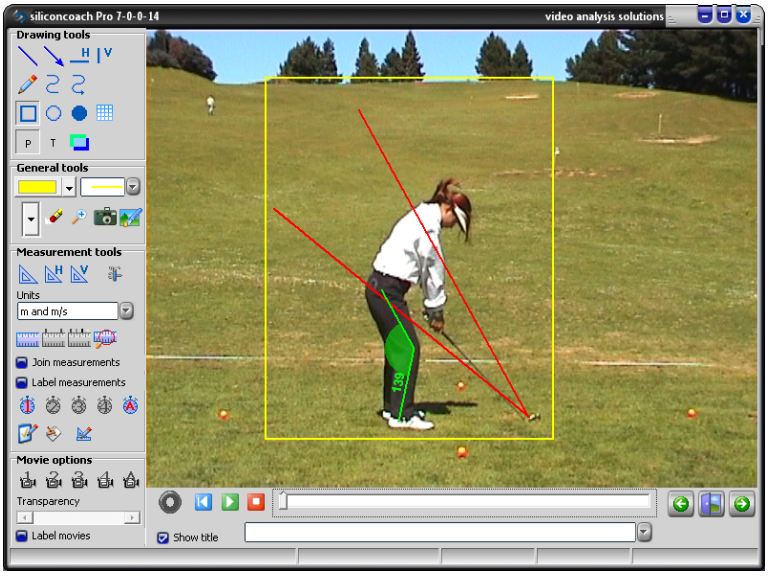
golf_analysis.jpg

Copy to clipboard

You can also save a section of your analysis to the clipboard for immediate transfer to an open report/presentation you may be working on.



- Press the 'Copy to Clipboard' icon.
- Select the part of the image you wish to copy to clipboard – a rectangle will appear on the screen.
- When you release the cursor, the image will be saved to memory.
- Go to your open report/presentation and go to Edit>Paste
- The selected image will then appear in your document.
- The image can then be resized or edited in the program you are using eg. WORD.



Copy to clipboard then paste in to report

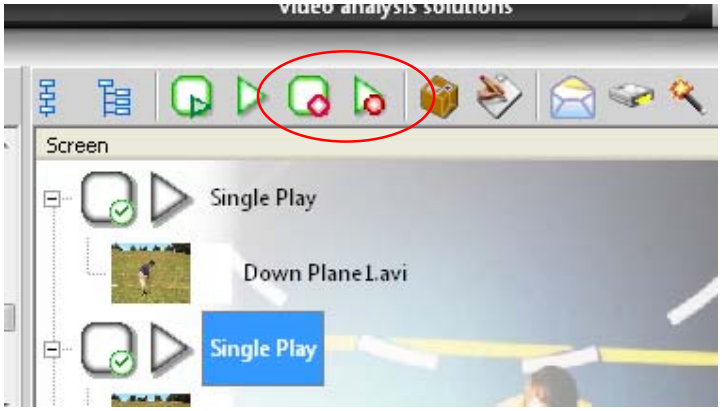
siliconcoach report
Date: January 25, 2008

Jane Smith Golf Analysis

Recording an analysis as a movie (advanced export)

Another way to export your presentation is to record your analysis (lines, text, and voice commentary) as a short movie and then send this to your player/client for them to view.

- Save your presentation first.
- Go to 'Settings' on the top menu and ensure 'Start recording in paused state' is checked.
- Press the **'Record from Selection'** button (records from a selected slide in your presentation) or **'Record'** button (records all presentation from the start).



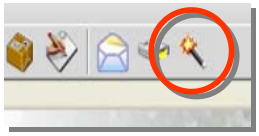
- When the Analysis window opens it will be in the Paused state as shown by the red icon (assuming you did the steps above).

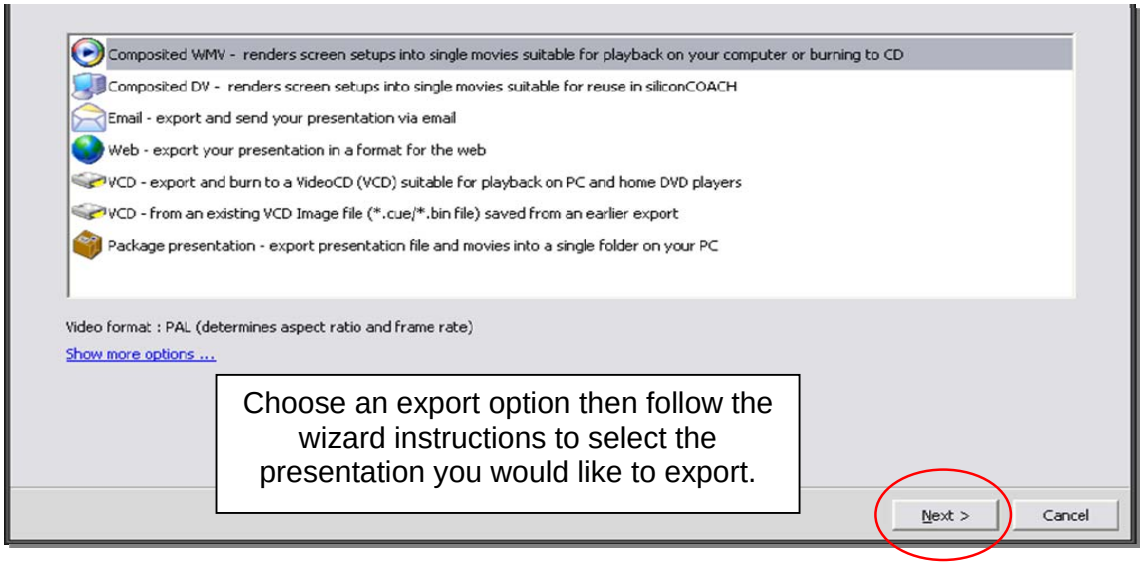
- When you are ready to start recording press the red **'Record'** button, it will turn yellow and will record your drawings and voice (assuming you have a microphone and it is activated in Windows).

- Work through an analysis as normal, pressing the yellow **'Pause'** button to think or prepare drawings etc.
- When you have finished, press the **'Exit'** button. You can then choose to save or delete your recording.

Save your recorded analysis to CD, email, or VCD

Once you have recorded and saved your analysis you can export it in different formats using the **Export Wizard**.



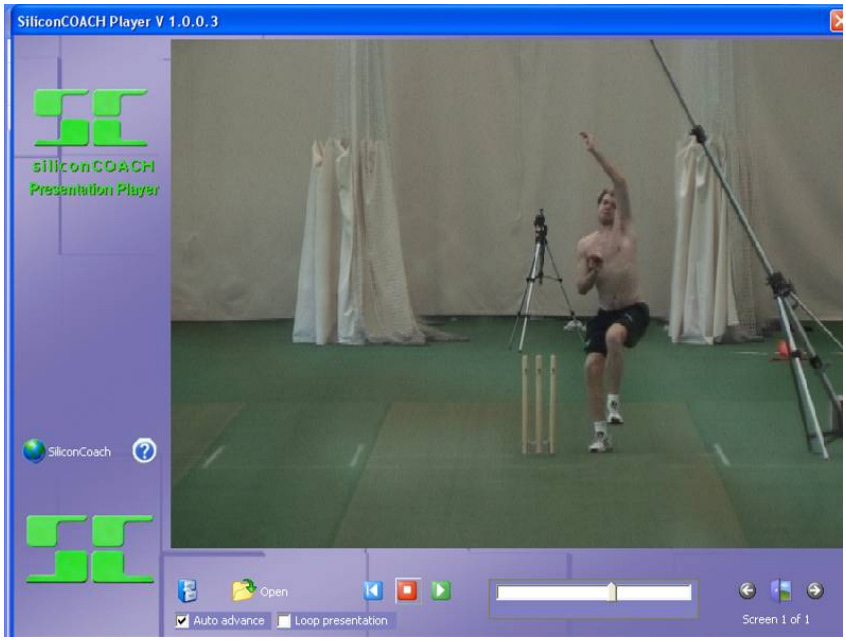

Composited WMV - renders screen setups into single movies suitable for playback on your computer or burning to CD
Composited DV - renders screen setups into single movies suitable for reuse in siliconCOACH
Email - export and send your presentation via email
Web - export your presentation in a format for the web
VCD - export and burn to a VideoCD (VCD) suitable for playback on PC and home DVD players
VCD - from an existing VCD Image file (*.cue/*.bin file) saved from an earlier export
Package presentation - export presentation file and movies into a single folder on your PC
Video format : PAL (determines aspect ratio and frame rate)
Show more options ...
Choose an export option then follow the wizard instructions to select the presentation you would like to export.
Next >
Cancel

Export options explained

Desired export format	Export method(s) options	How does it export your presentation?
Burn to a data CD **Note**: All options will make files or folders that you can burn to a CD using your normal CD burning software (not Pro)	Composited WMV	Compresses your presentation to .WMV files to play in Windows Media Player.
	Composited DV	Converts your presentation to an .AVI to re-use in siliconcoach
	Package Presentation	Creates a folder with all your movie files. High quality video with no compression.
Email	Email	Your presentation will be compressed to send via email. Check the size before you send as the files may still be quite large.
Create a VCD to play on a home DVD player	VCD	Uses normal writeable CDs and can be played on MOST home DVD players. Note there will be no menus created like traditional movie DVDs.

How to view an exported presentation

- Once you have exported your presentation it will be saved as a new sub-folder in the exported format in C:\My Documents\siliconcoach folder.
- Navigate to this folder using Windows Explorer and open the presentation folder you wish to view.
- If you have used package presentation, there will be a **'siliconcoach Player'** icon in your folder. Double-click this icon and your presentation will begin playing in the player screen.
- Siliconcoach player is a stand-alone viewer – siliconcoach Pro does not need to be installed on the computer to be able to view the presentation.



- If you have used email or composited wmv export options you will be able to use Windows Media Player to view your compressed presentation movies.
- To play the movies using Windows Media Player, double-click the 'Playlist' file in your exported presentation folder and this will play your movies in sequence.

CHECKLIST:

At this stage of the training course you should have an understanding of:

- How to create a still-image (jpg) of your analysis screen to use in reports or presentations.
- How to record a movie of your presentation with drawings, voice, or text.
- How to save your movie presentation to send via CD, email or VCD.
- What the different export formats are and when to use each one.
- How to view an exported siliconcoach presentation.

NOTES:

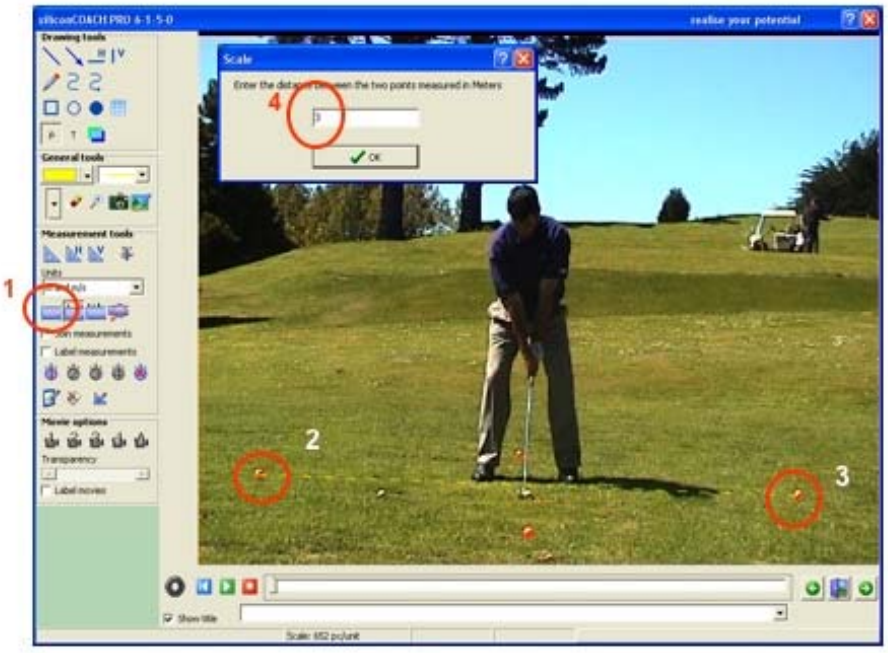
ADVANCED FUNCTIONS

Measuring distances

Siliconcoach enables you to measure distances by converting pixels on screen to a real-life distance. To measure distances you need to set the scale using the measurement you noted on the day of filming (see page 4).

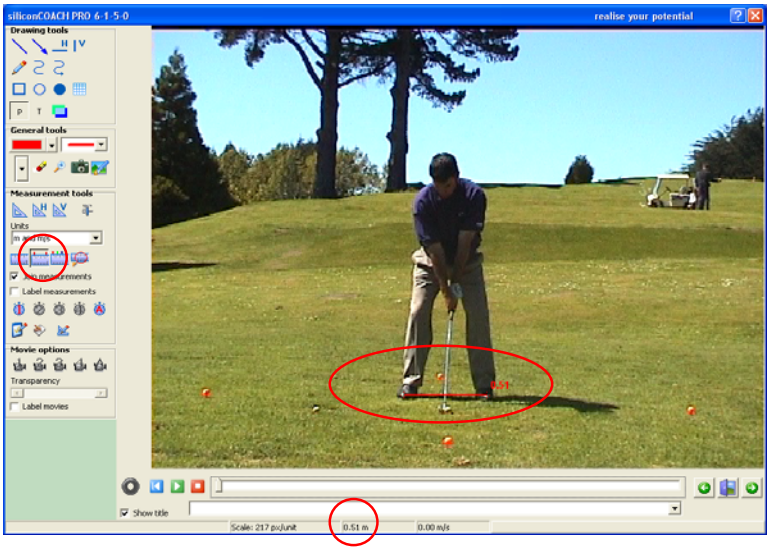
Setting a scale *(Numbers relate to those in the image below)*

1. Press the **'Set Scale'** button.
2. Click on the first point of your scale.
3. Click on the second point of your scale.
4. Enter the real-life distance (in metres) in the box as illustrated.



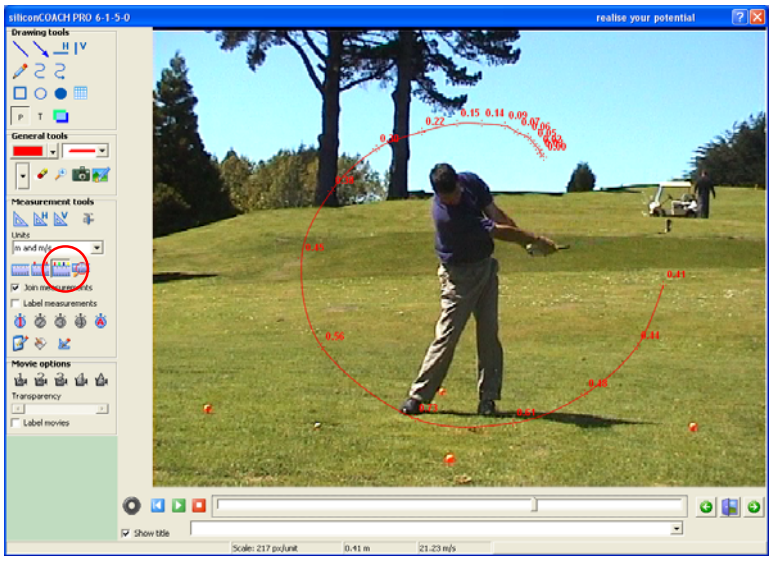
Measure distance between two points (discrete distance)

- After you have set the scale, press the **'Discrete distance'** button.
- Click on two points you want to measure (e.g. stance length).
- The result appears on the screen and also along the bottom of the window.



Measure continuous distance and speed

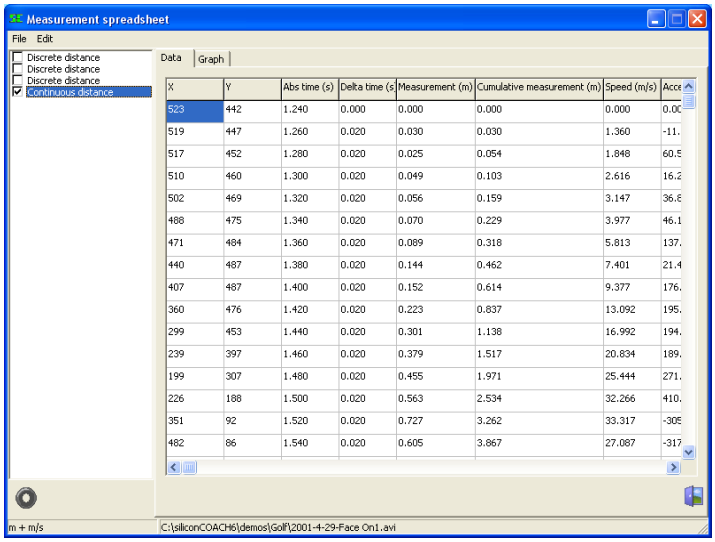
- After you have set the scale, press the **'Continuous distance'** button.
- Click on a point for which you want to measure the speed of (for example club rotation, ball flight, bat speed etc).
- Advance frame by frame through the video footage, clicking on the point you are tracking. The distance between each point is measured.
- Tick **'Join Measurements'** if you wish to plot the path of the object over the frames.
- The speed is calculated by distance divided by time.



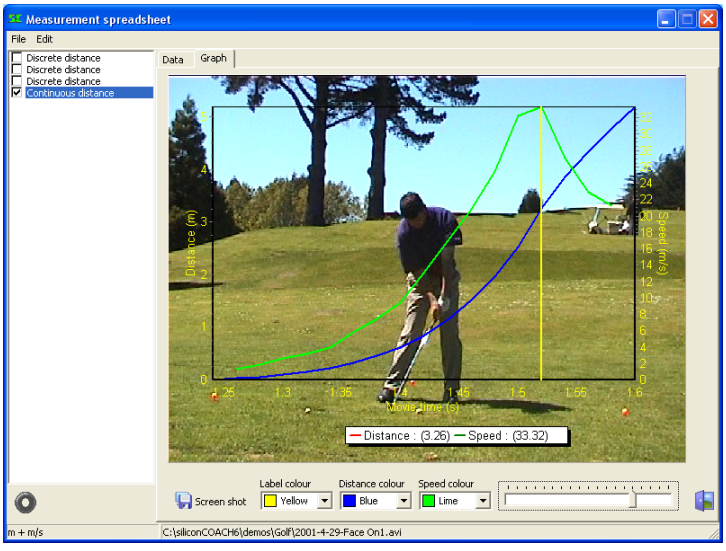
Graphing data

To help visualise the speed of the point you are tracking, the data can be presented and then graphed in Pro.

- When you have completed plotting the continuous distance press the **'Show Measurements'** button.
- The raw data will be shown in spreadsheet format. This can be copied and pasted for further analysis in Excel or other software.



- Click the 'Graph' tab and the data will be graphically displayed.
- Press the **'Screen shot'** button to save the image as a jpg file



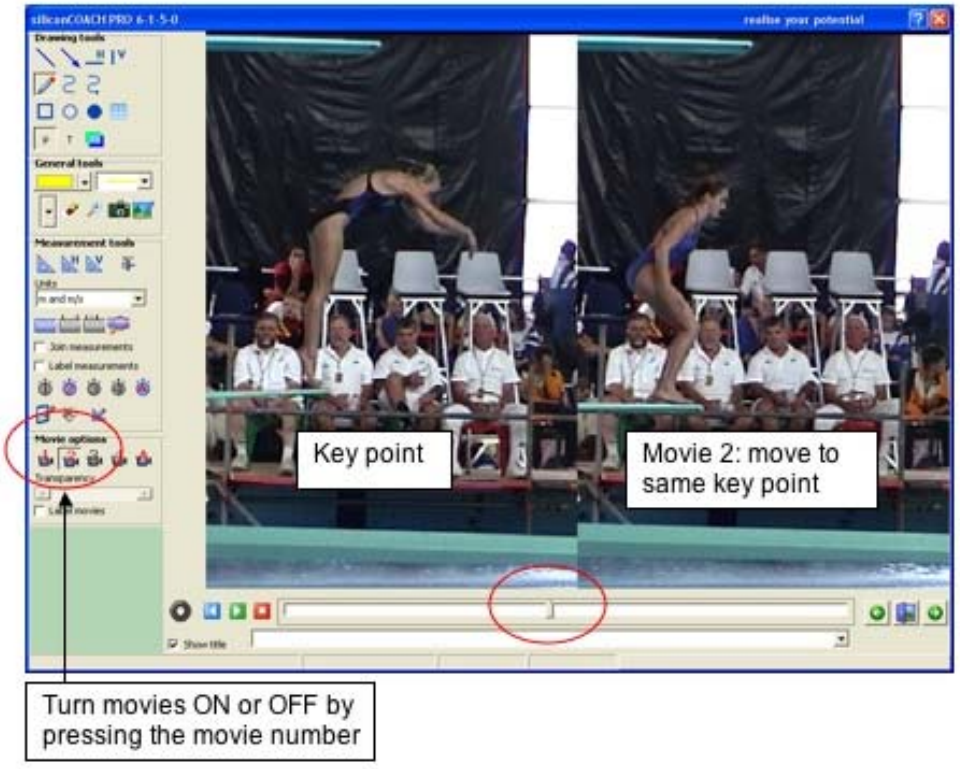
SYNCHRONISING MOVIES

Siliconcoach allows you to synchronise up to 4 movies to the same key point to allow for better comparison and analysis.

Temporary synchronise

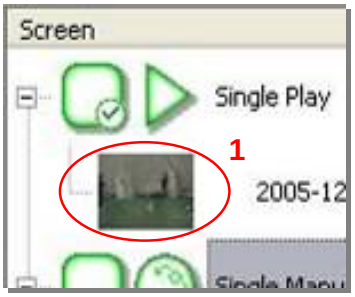
The temporary synchronise tool allows you to quickly synchronise movies in the MANUAL screen. The editing is not saved so the next time you open the presentation, the movies will not be synchronised.

1. Move the movie slider until Movie 1 is on a key point.
2. Turn OFF Movie 1 by depressing **'camera 1'** button under Movie Options.
3. Move the movie slider until Movie 2 is on the same key point.
4. Turn ON Movie 1 again by pressing down '**camera 1'** button.
5. Drag slider back to start to watch synchronised movies.
6. Changes will be lost if you close the presentation.

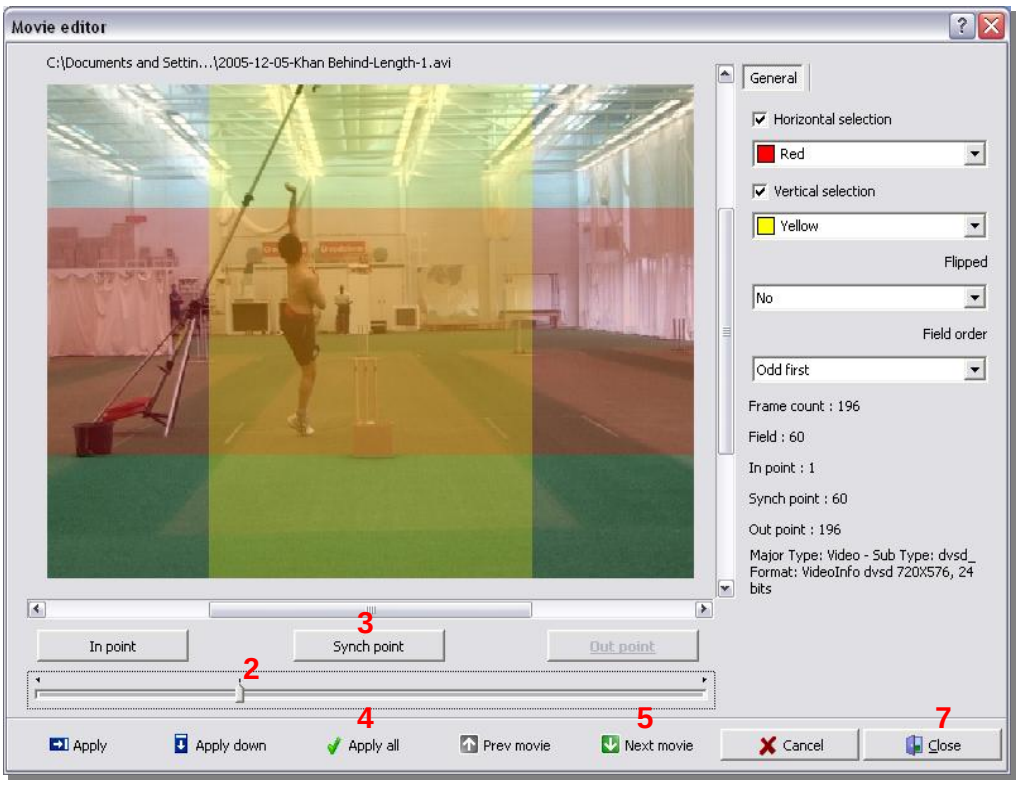


Permanent Synchronise

To save movies in a synchronized state in a presentation, a permanent synchronise is required.



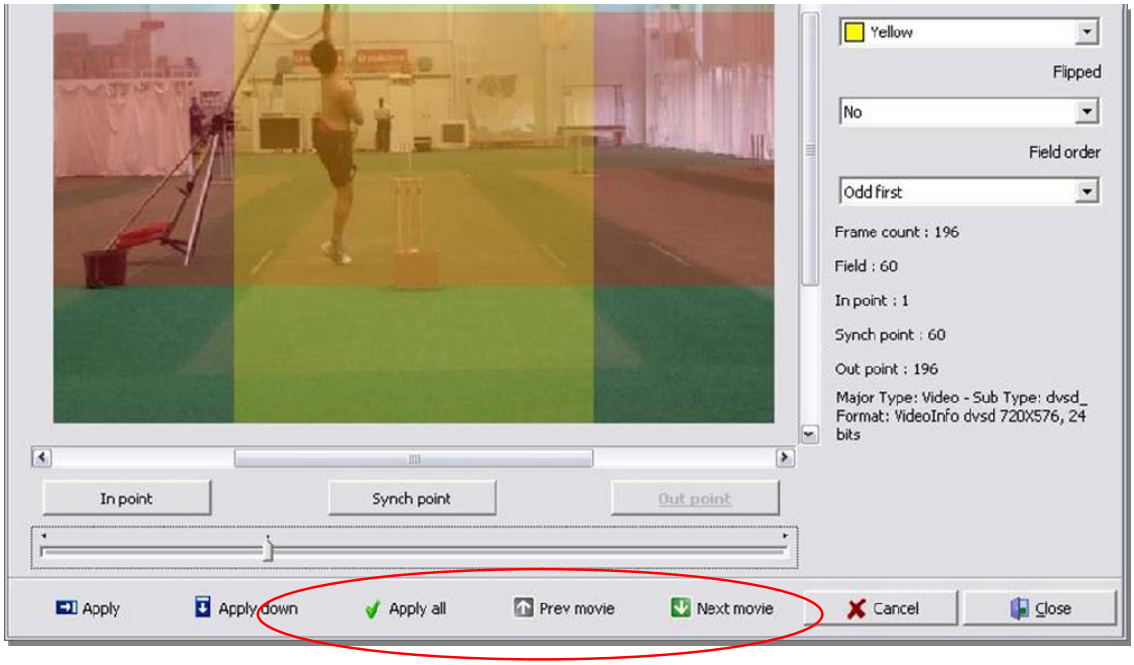
1. Open the Movie Editor screen by double-clicking on the movie thumbnail.
2. Use the slider to move the movie to a key point.
3. Press the **'Synch point'** button.
4. Click **'Apply all'**.
5. Click **'Next movie'.**
6. Repeat for the next movie you wish to synchronise.
7. Press **'Close'** to return to presentation.



Movie Editing: Setting Viewing Zones

If you are viewing two or more movies in a screen, you may need to adjust the viewing zone so that each movie is centered correctly.

1. Adjust the sliders:
   - If using a dual vertical slide: Movie appropriate slider so subject is centered in the middle of the yellow box.
   - If using a dual horizontal slide: Move appropriate slider so subject is centered in the middle of the red box.
2. Click **'Apply all'.**
3. Click **'Next movie'**. Repeat for next movie if required.
4. Press **'Close'** to exit Movie Editor.



Flip movies

In siliconcoach Pro you can create a mirror image of your movie. This is useful when comparing left hand/foot dominant players with right hand/foot dominant players.

- In the Movie Editor box, select 'Yes' under the 'Flipped' drop down menu.
- Click 'Apply all'
- Click **'Next movie'** or press **'Close'** to exit.

CHECKLIST:

At this stage of the training course you should have an understanding of:

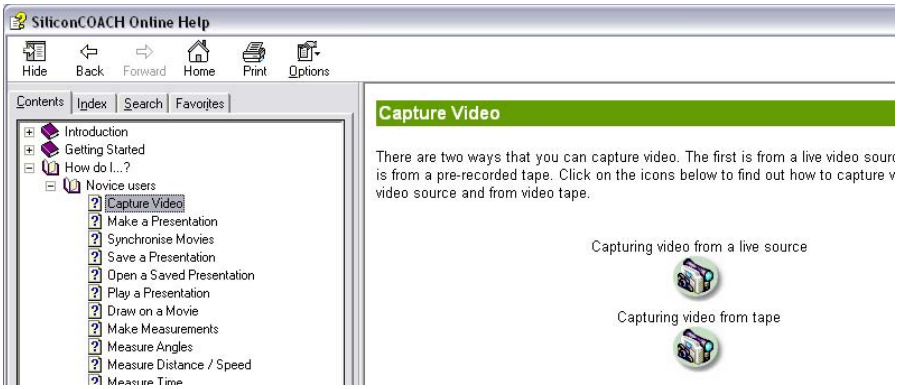
- How to use a scale and measure discrete and continuous distances.
- How to synchronise movies (temporary) in the Manual screen setup slides.
- How to synchronise movies permanently using Movie Editor and save these changes.
- How to edit the movies and change viewing zones in Movie Editor.
- How to flip the movie in Movie Editor.

NOTES:

FURTHER ASSISTANCE

Help Menu

- To access the full help system, go to Help>siliconcoach Help. The electronic Help system will start up as shown below.



- On the left of the screen you will see a list of headings. Click on 'How Do I?', then select the task you would like help with, for example 'Capture Video'.
- The Help screen will then display some text and icons. By clicking on the thumbnail icons, a Help animation will start playing to show you how to complete the task.

NOTE that F1 also starts the Help at any time in the software

Manuals

- The full PDF user manual for siliconcoach software can be found by going to http://www.siliconcoach.com/SupportCentres/#support_centers and choosing the Pro Support Centre.

Contact Us

If you have any further queries, please contact support@siliconcaoch.com .